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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/726,968	12/02/2003	Andrew J. Ouderkirk	59418US002	4393

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EXAMINER	
ARTMAN, THOMAS R	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 08/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/726,968	OUDERKIRK ET AL.	
	Examiner	Art Unit	
	Thomas R. Artman	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 2 and 8 are objected to because of the following informalities: both claims recite limitations that are now recited verbatim in parent claim 1. These claims are now redundant and therefore should be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5, 6, 8, 9 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller (US 6,155,699) in view of Schrenk (US 5,540,978).

Regarding claims 1, 2, 8, 15 and 16, Miller discloses a light source and method of manufacture, (Figs.2-3), including:

a) (providing) an LED 12 that emits excitation light,

b) (positioning) a layer of phosphor material 36 positioned to receive excitation light, the phosphor material emitting visible light when illuminated with the excitation light ("primary light," col.3, lines 61-63), and

c) (positioning and shaping) a non-planar, multilayer reflector 30 being positioned between the phosphor material and the LED, where the reflector transmits the excitation light and reflects visible light ("secondary light," col.3, line 47 through col.4, line 9).

Miller does not specifically disclose that the reflector is flexible or that it is made of a polymeric material that resists degradation when exposed to blue, violet or ultraviolet light.

Schrenk specifically teaches a flexible, all organic (polymeric) multilayer reflector, where the polymer materials are suitable for visible as well as UV operation, since the polymeric materials do not absorb UV or visible light, thus resisting degradation that may be caused by blue, violet or UV light (see Abstract, as well as col.2, lines 62-66; col.5, lines 28++). The use of polymers decreases the overall weight of the device, provides a cheaper device, both in raw material cost and manufacturing cost, as well as providing better thermal expansion property matching with Miller's epoxies and resins (28 and 22) such that flaws due to thermal fatigue are minimized for improved longevity of the device.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Miller to use polymeric materials suitable for multilayer reflectors in visible and UV applications, as taught by Schrenk, in order to improve the cost efficiency, weight and longevity of the light source, as taught by Schrenk and as is known in the art.

With respect to claims 5 and 6, the Miller/Schrenk combination results in the polymeric multilayer reflector having a hemispherical concave shape.

With respect to claim 7, Miller further discloses that the phosphor material is disposed on the multilayer reflector (Figs.2-3).

With respect to claim 9, Schrenk further teaches that the layers are substantially free of inorganic materials (col.3, line 51 through col.4, line 3).

With respect to claim 17, Schrenk further teaches thermoplastic polymers, including polymethylpentene (col.3, lines 64-67). Therefore, during manufacture, the materials are thermoformed.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller and Schrenk, as applied to claims 1 and 15 above, in view of Weber et al. ("Giant Birefringent Optics in Multilayer Polymer Mirrors"; hereinafter Weber).

Schrenk teaches thermoplastic polymers (including polymethylpentene, col.3, lines 64-67).

Neither Miller nor Schrenk teach that at least some of the layers are birefringent.

Weber teaches the known advantages of making at least some of the layers in a multilayer stack birefringent, providing improved reflectivity properties in order to decrease the amount of light that is reflected back to the source, thus improving light output efficiency.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for at least some of the layers of the polymeric multilayer reflector of

the Miller/Schrenk combination to be birefringent in order to improve the efficiency of the device, as suggested by Weber.

Claims 4 and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller and Schrenk, as applied to claim 1 above, in view of Levinson (US 6,653,765).

With respect to claim 4, Miller does not disclose the use of a UV excitation light. The excitation light of Miller is blue.

Levinson teaches the use of LEDs that produce excitation light of UV and/or blue light in the GaN family of LEDs, where the UV emittance is used solely to stimulate the phosphor, and the blue light is also used to stimulate the phosphor. The bands are often emitted simultaneously by the same device (UV/blue LED).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Miller to use UV excitation light as suggested by Levinson and as is known in the art, since UV and blue wavelengths are functional equivalents, and further providing the advantage of being able to use more types of phosphors that are stimulatable by UV wavelengths much more efficiently than by blue wavelengths.

With respect to claims 10 and 11, Miller does not disclose that the phosphor material is discontinuous, or more specifically, being made of a plurality of dots.

Levinson specifically teaches the use of a discontinuous, powdered (dots) phosphor material (col.8, lines 40-42). In this way, light conversion is more efficient than a phosphor in bulk form (see Abstract, as well as col.2, lines 27-32).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Miller to use a discontinuous phosphor as a plurality of dots as taught by Levinson for the purpose of improving light generation efficiency.

With respect to claim 12, Levinson does not specifically teach the size of the phosphor dots, specifically having areas less than 10,000 square microns. Levinson does teach, however, that the size of each dot needs to be sufficient for most of the UV/blue light to be converted to yellow light (col.8, lines 46-48).

Therefore, it is well within routine experimentation of the skilled artisan to determine the optimum area of the dots of phosphor for most of the excitation light to be converted to secondary light.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the Miller/Levinson combination to have dots having areas smaller than 10,000 square microns, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to make the dots with areas smaller than 10,000 square microns for the purpose of improving light conversion efficiency In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) See also In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

With respect to claims 13 and 14, Levinson further teaches that the phosphor dots emit light red, green and blue light when illuminated with excitation light, and further that multiple types of phosphors may be mixed together (col.7, line 64 through col.8, line 24 and lines 41-48).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-17 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 4, 5, 8-10, 16-19 and 26 of copending Application No. 10/726,995 in view of Miller (US 6,155,699).

Claim 1 is identical to claim 1 of the copending application, except for the limitation that the flexible multilayer reflector is non-planar.

Miller specifically teaches the practice of making a multilayer reflector non-planar for the purpose of improving the efficiency and transmission characteristics of the multilayer reflector by narrowing the angle of incidence of the excitation light from the

diode (Figs.2-3; col.2, lines 27-55; col.3, lines 34-46). In this way, nearly all of the excitation light is transmitted by the multilayer reflector.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for claim 1 of the copending application to make the multilayer reflector non-planar as taught by Miller in order to significantly improve the efficiency of the multilayer reflector to transmit the excitation light.

Claims 2-4 and 7-14 are identical to claims 2, 4, 5, 10, 8, 9, 16-19 and 26, respectively in that order, of the copending application.

Claims 5 and 6 are further taught by Miller, in which the multilayer reflector is disclosed as having a hemispherical, concave shape (col.3, lines 39-41).

Claims 15-17 merely require the method of providing the structure of claims 1 and 3, and therefore are rejected over the same grounds for the same reasons.

This is a provisional obviousness-type double patenting rejection.

Claims 1-17 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 5-7, 9, 10, 13-21, 23, 24, 28, 31-33 and 35-39 of copending Application No. 10/726,790. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 1,

8 and 15 require that the polymeric multilayer reflector is resistant to degradation caused by UV radiation.

However, as is known to one skilled in the art, UV radiation is prevalent due at least to sunlight, and to a lesser extent, certain artificial light sources, particularly in light sources that use UV light as excitation light. As a result, it is necessary for polymeric materials to be UV resistant in order to improve the longevity of the device during operation, particularly if operated outside. Furthermore, if the device uses UV radiation as excitation light, then the polymers must be resistant to UV degradatuib or the device would be rendered inoperable in a short period of time.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have a polymeric multilayer reflector that is resistant to UV degradation in order to increase the operating life of the device, as is known in the art.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

Applicant's arguments, filed July 24th, 2006, with respect to the prior art reference Fleming (US 6,172,810 B1) have been fully considered and are persuasive. The rejections based upon Fleming have been withdrawn.

Applicant's arguments filed January 9th, 2006, have been fully considered but they are not persuasive. Applicants argue that the combination of Schrenk with Miller lacks a "reasonable expectation of success" because the reflector of Schrenk reflects UV light and is transmissive to visible light, thus rendering the light source of Miller inoperable. The examiner respectfully disagrees.

The issues here are 1) whether or not such polymers as claimed exist, and 2) whether or not such polymers are obvious for use in light sources. First, as clearly stated in Schrenk, and as agreed upon by Applicants, the polymers as claimed exist: resistant to blue, violet or UV light and useful as DBR filters for light sources.

Second, the layers in Schrenk are being used in light sources for at least the reasons of being cost effective materials. Also, as is known in the art, the polymeric materials have a better thermal expansion coefficient match with the epoxies and resins of Miller in items 22 and 28, than do the ceramic and glass reflector materials disclosed in Miller. Furthermore, several prior art references in the conclusion of this Office action show that organic DBRs have been used in LED devices for years.

Although it is true that the particular reflector embodiment of Schrenk teaches UV reflectance and transmission of all visible wavelengths, the examiner wishes to remind applicants that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

In this case, one of ordinary skill is well aware of the fact that a DBR device can be tailored to reflect/transmit any wavelength band within the UV/visible/IR range by simply adjusting the thicknesses of the layers according to Bragg's Law, which is shown in Schrenk, starting in col.5, line 28++. This is also supported at least by Singer (US 5,813,752; col.2, lines 22-28) cited in the Conclusion of this Office action. What is important is that it is obvious to use organic materials that are resistant to degradation caused by blue, violet and UV light in the light source of Miller. The light source of Miller is blue, and the surrounding materials of epoxy and resin are organic. The organic reflector of Schrenk is relatively immune to degradation to blue light, and is more cost effective, as taught by Schrenk, and further provides the additional advantage of reducing thermal stresses in the device of Miller caused by thermal expansion mismatches between materials. The specific reflective properties of a particular disclosed embodiment of Schrenk are immaterial since it is well within routine experimentation for the skilled artisan to calculate the necessary thicknesses and make a device with the appropriate thicknesses.

Therefore, there is a very reasonable expectation of success in substituting the polymeric multilayer materials of Schrenk for the ceramic and glass multilayer materials of Miller. In fact, the skilled artisan would expect an improvement over the materials used by Miller for at least the advantages of improved thermal properties and cheaper cost/manufacture.

Therefore, the combination of Miller and Schrenk provides a *prima facie* case of obviousness under 35 USC 103(a).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Singer (US 5,813,752) teaches the obviousness of tailoring thicknesses of DBR layers to reflect/transmit desired wavelengths, as well as teaches the obviousness in placing a DBR after a phosphor, opposite to the LED location (col.2, lines 7-34).

US patents to Vriens (US 5,813,753 and 4,882,617) teach the known use of UV/blue LEDs as well as granulated phosphors, DBRs on either side or both sides of the phosphor, and birefringent layers.

Garbuzov (US 5,874,803) teaches that organic layers are preferred for the purpose of reducing harmful thermal effects in manufacturing DBR reflectors for solid state light sources (col.3, lines 38-54).

Araki (US 6,724,140 B2) teaches that ceramic, glass, metal and polymer materials are functional equivalents for DBRs in solid state light sources.

Wheatly (US 5,552,927) teaches the obviousness of tailoring layer thicknesses to the desired transmissive/reflective properties of a DBR.

McNulty (US 6,686,676 B2) teaches the practice of placing the DBR on the far side of the phosphor away from the LED.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thomas R. Artman
Patent Examiner

Courtney Thomas
Primary Examiner